City of Cambridge Contributory Retirement System

Actuarial Valuation and Review as of
January 1, 2016

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August 1, 2016

Retirement Board
City of Cambridge Contributory Retirement System
100 CambridgePark Drive, Suite 101
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Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2016. It summarizes the actuarial data used in the valuation, establishes the funding requirements for fiscal 2017 and later years and analyzes the preceding two years' experience.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the Cambridge Retirement System. That assistance is gratefully acknowledged.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

An actuarial valuation is a measurement at a specific date – it is not a prediction of a plan's future financial condition. We have not been retained to perform an analysis of the potential range of financial measurements, except where otherwise noted.

The actuarial calculations were directed under my supervision. I am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of my knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in my opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By: 

Kathleen A. Riley, FSA, MAAA, EA
Senior Vice President and Actuary

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SECTION 1

VALUATION SUMMARY

SECTION 2

VALUATION RESULTS

SECTION 3

SUPPLEMENTAL INFORMATION

SECTION 4

REPORTING INFORMATION

Purpose

This report has been prepared by Segal Consulting to present a valuation of the City of Cambridge Contributory Retirement System as of January 1, 2016. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The contribution requirements presented in this report are based on:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of January 1, 2016;
- The assets of the System as of December 31, 2015;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.

Certain disclosure information required by Governmental Accounting Standards Board Statements (GASB) Numbers 67 and 68 as of December 31, 2015 for the City of Cambridge Contributory Retirement System, a cost-sharing multiple-employer defined benefit pension plan, is provided in a separate report.

Significant Issues in Valuation Year

The following key findings were the result of this actuarial valuation:

1. The actuarial valuation report as of January 1, 2016 is based on financial information as of that date. Changes in the value of assets subsequent to that date, to the extent that they exist, are not reflected.
2. During the plan years ended 2014 and 2015, the market value rates of return were 6.30% and -0.61%, respectively. With this valuation, the actuarial value of assets was set equal to the market value of assets as of December 31, 2015. The actuarial rates of return for the plan years ended 2014 and 2015 (prior to the change in asset method) were 11.05% and 7.91%, respectively. The actuarial value of assets and market value of assets as of December 31, 2015 were $1.084 billion as reported in the Annual Statement. As of December 31, 2013, the actuarial value of assets of $949.7 million was 90.8% of the market value of assets of $1.046 billion.

3. This valuation reflects the following changes in actuarial assumptions and methods:
   - The investment return assumption was lowered from 7.875% to 7.75%.
   - The mortality assumption for non-disabled participants was changed from the RP-2000 Combined Healthy Mortality Table projected 17 years using Scale AA to the RP-2000 Employee and Healthy Annuitant Mortality Tables projected generationally from 2009 using Scale BB2D.
   - The mortality assumption for disabled participants was changed from the RP-2000 Combined Healthy Mortality Table set forward five years projected 17 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2015 using Scale BB2D.
   - The salary increase assumption was lowered from 4.75% to 4.50%.
   - The administrative expense assumption was changed from $1,100,000 for calendar 2014 to $1,150,000 for calendar 2016.
   - The actuarial value of assets was set equal to the market value of assets as of December 31, 2015.

   The changes in assumptions and asset method increased the unfunded liability by $76.9 million and increased the employer normal cost by $865,578.
4. This valuation reflects the following change in the plan provisions:
   - As permitted by Section 63 of Chapter 139 of the Acts of 2012, the Board has increased the Section 101 annual allowance from $9,000 to $12,000.
5. The unfunded liability was expected to decrease from $250.2 million as of January 1, 2014 to $237.2 million as of January 1, 2016. The actual unfunded liability of $252.9 million is $15.7 million higher than expected primarily due to the changes in assumptions and asset method noted above, partially offset by an investment gain on an actuarial basis and an experience gain due to demographics as detailed in Chart 13 of Section 2.

6. The recommended contribution for fiscal 2017 was set at the City's previously budgeted amount of $39,747,891, plus an additional contribution of $300,000, for a total amount of $40,047,891. In fiscal 2018 and later years, the recommended contribution will be the prior years' budgeted amount increased 5.85% plus an additional contribution of $300,000. This will result in a total fiscal 2018 appropriation of $42,373,143 and a total fiscal 2019 appropriation of $44,834,422. Under this funding schedule, the System will be fully funded by 2026, the same as in the funding schedule adopted with the prior valuation. Chart 16 in Section 2 shows the detail of the funding schedule.
7. The funded ratio has increased from 79.15% as of January 1, 2014 to 81.09% as of January 1, 2016 on an actuarial value basis (including the change in asset method). On a market value basis, the funded ratio decreased from 87.15% to 81.09%.

Summary of Key Valuation Results

	2016	2014
Contributions for fiscal year beginning July 1:		
Recommended for fiscal 2017 and 2015	$40,047,891	$35,775,814
Recommended for fiscal 2018 and 2016	42,373,143	37,851,149
Recommended for fiscal 2019 and 2017	44,834,422	40,047,891
Funding elements for plan year beginning January 1:		
Normal cost, including administrative expenses	$31,928,306	$30,891,673
Market value of assets (MVA)	1,084,498,793	1,045,733,743
Actuarial value of assets (AVA)	1,084,498,793	949,691,684
Actuarial accrued liability	1,337,405,483	1,199,887,878
Unfunded actuarial accrued liability	252,906,690	250,216,274
Funded ratio based on the MVA	81.09%	87.15%
Funded ratio based on the AVA	81.09%	79.15%
Demographic data for plan year beginning January 1:		
Number of retired participants and beneficiaries	2,019	1,966
Number of inactive participants entitled to a return of their employee contributions	728	812
Number of inactive participants with a vested right to a deferred or immediate benefit	126	130
Number of active participants	3,019	3,145
Total payroll	$211,726,778	$208,967,363
Average payroll	70,131	66,444

Note: Payroll figures are for the prior calendar year.

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal Consulting ("Segal") relies on a number of input items. These include:

- **Plan of benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.

- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by the City of Cambridge Contributory Retirement System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.

- **Assets** The valuation is based on the market value of assets as of the valuation date, as provided by the City of Cambridge Contributory Retirement System. The City of Cambridge Contributory Retirement System uses an "actuarial value of assets" that may differ from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.

- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan's assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The actuarial valuation is prepared at the request of the City of Cambridge Contributory Retirement System. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- Sections of this report may include actuarial results that are not rounded, but that does not imply precision.
- If the City of Cambridge Contributory Retirement System is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The City of Cambridge Contributory Retirement System should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of the Plan, it is not a fiduciary in its capacity as actuaries and consultants with respect to the Plan.

A. PARTICIPANT DATA

The Actuarial Valuation and Review considers the number and demographic characteristics of covered participants, including active participants, inactive participants, retired participants and beneficiaries.

This section presents a summary of significant statistical data on these participant groups.

More detailed information for this valuation year and the preceding valuation can be found in Section 3, Exhibits A and B.

A historical perspective of how the participant population has changed over the past ten valuations can be seen in this chart.

CHART 1

Participant Population: 1997 – 2015

Year Ended December 31	Active Participants	Inactive Participants*	Retired Participants and Beneficiaries	Ratio of Non-Actives to Actives
1997	3,400	380	1,606	0.58
1999	3,655	392	1,629	0.55
2001	3,870	675	1,662	0.60
2003	3,825	822	1,746	0.67
2005	3,739	1,070	1,739	0.75
2007	4,119	918	1,756	0.65
2009	3,614	1,174	1,809	0.83
2011	3,332	1,154	1,893	0.91
2013	3,145	942	1,966	0.92
2015	3,019	854	2,019	0.95

** Excludes terminated participants due a refund of employee contributions prior to 2001.*

Active Participants
Plan costs are affected by the age, years of service and payroll of active participants. In this year's valuation, there were 3,019 active participants with an average age of 48.0, average years of service of 14.6 years and average payroll of $70,131. The 3,145 active participants in the prior valuation had an average age of 47.8, average service of 14.3 years and average payroll of $66,444.

Among the active participants, there were none with unknown age and/or service information.

Inactive Participants
In this year's valuation, there were 126 participants with a vested right to a deferred or immediate vested benefit and 728 participants entitled to a return of their employee contributions.

These graphs show a distribution of active participants by age and by years of service.

CHART 2

Distribution of Active Participants by Age as of December 31, 2015

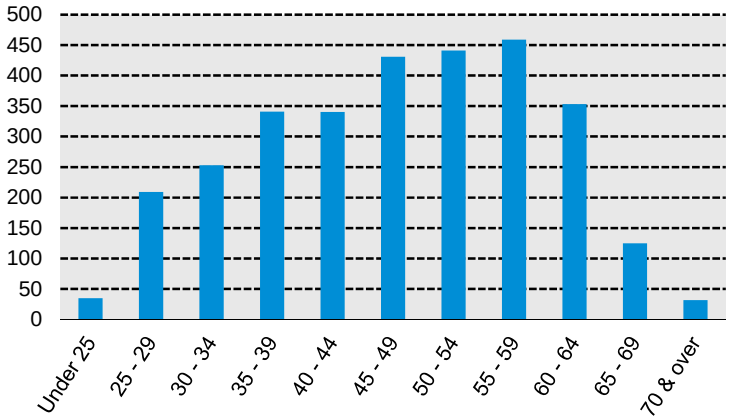
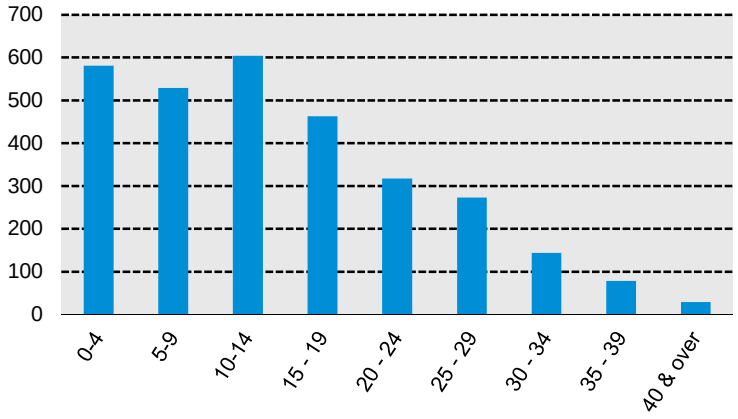


CHART 3

Distribution of Active Participants by Years of Service as of December 31, 2015



Retired Participants and Beneficiaries

As of December 31, 2015, 1,657 retired participants and 362 beneficiaries were receiving total monthly benefits of $5,582,111, excluding COLAs reimbursed by the Commonwealth. For comparison, in the previous valuation, there were 1,605 retired participants and 361 beneficiaries receiving monthly benefits of $4,923,131, excluding COLAs reimbursed by the Commonwealth.

These graphs show a distribution of the current retired participants and beneficiaries based on their monthly amount and age, by type of pension.

CHART 4

Distribution of Retired Participants and Beneficiaries by Type and by Monthly Amount as of December 31, 2015

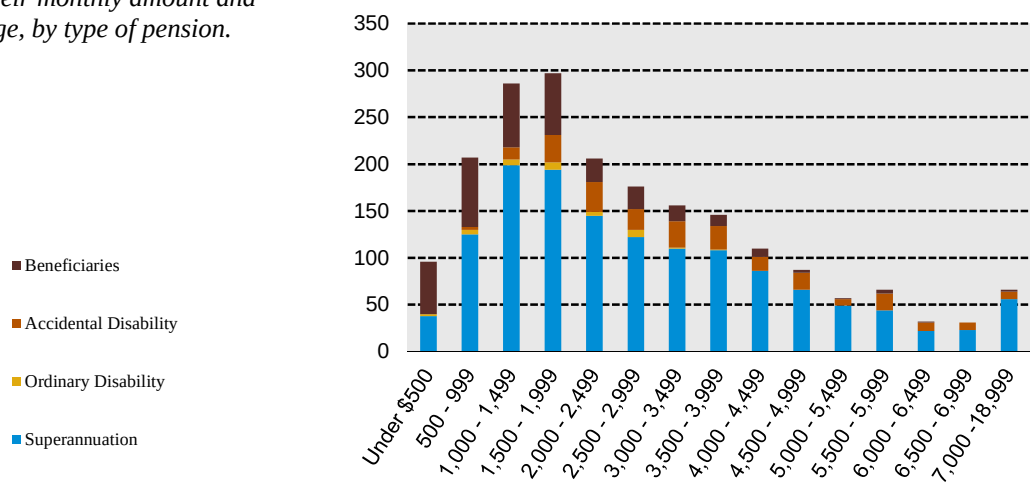
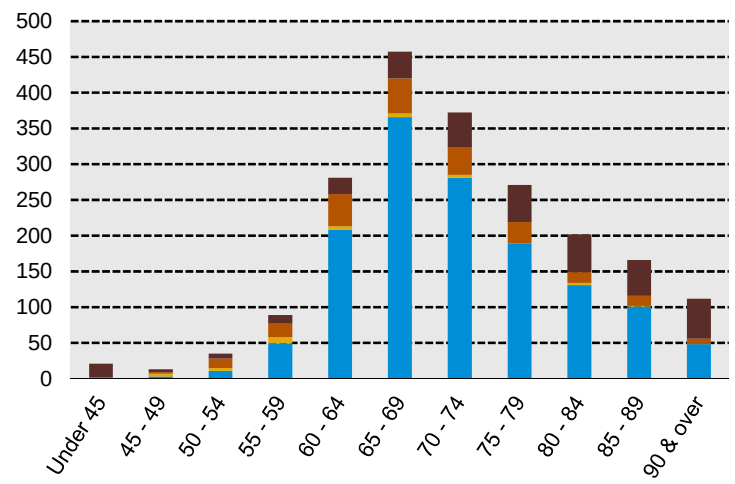


CHART 5

Distribution of Retired Participants and Beneficiaries by Type and by Age as of December 31, 2015



B. FINANCIAL INFORMATION

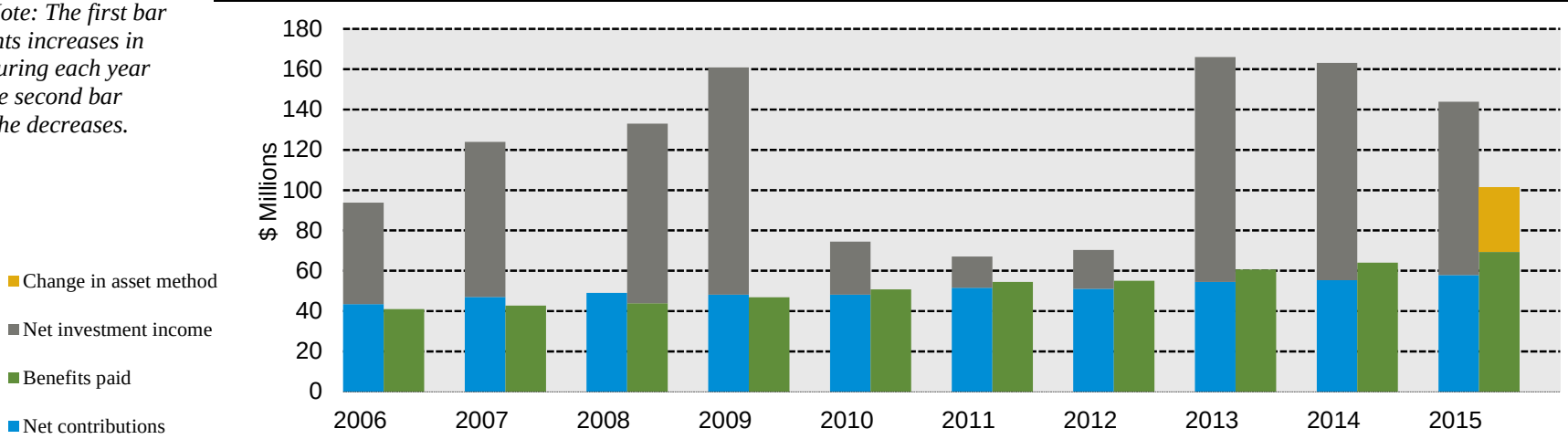
Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and net investment earnings (less investment fees) will be needed to cover benefit payments.

Retirement plan assets change as a result of the net impact of these income and expense components. Additional financial information, including a summary of these transactions for the valuation year, is presented in Section 3, Exhibits C and D.

The chart depicts the components of changes in the actuarial value of assets over the last ten years. Note: The first bar represents increases in assets during each year while the second bar details the decreases.

CHART 6

Comparison of Increases and Decreases in the Actuarial Value of Assets for Years Ended December 31, 2006 – 2015



The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

CHART 7

Determination of Actuarial Value of Assets

			Year Ended December 31, 2015	Year Ended December 31, 2014
1. Market value of assets			$1,084,498,793	$1,102,627,150
2. Calculation of unrecognized return*	Original Amount	Unrecognized Return		Unrecognized Return
(a) Year ended December 31, 2015	-$93,098,597	-$74,478,877		N/A
(b) Year ended December 31, 2014	-16,396,780	-9,838,068		-$13,117,424
(c) Year ended December 31, 2013	105,973,263	42,389,305		63,583,958
(d) Year ended December 31, 2012	50,523,226	10,104,645		20,209,290
(e) Year ended December 31, 2011	-67,530,762	0		-13,506,153
(f) Total unrecognized return			-31,822,995	57,169,671
3. Preliminary actuarial value: (1) - (2f)			1,116,321,788	1,045,457,479
4. Adjustment to be within 20% corridor			0	0
5. One-time adjustment to set actuarial value of assets equal to market value of assets			-31,822,995	N/A
6. Final actuarial value of assets: (3) + (4) + (5)			$1,084,498,793	$1,045,457,479
7. Actuarial value as a percentage of market value: (6) ÷ (1)			100.0%	94.8%
8. Amount deferred for future recognition: (1) - (6)			$0	$57,169,671

** Unrecognized return is the difference between total return and expected return on a market value basis and is recognized over a five-year period.*

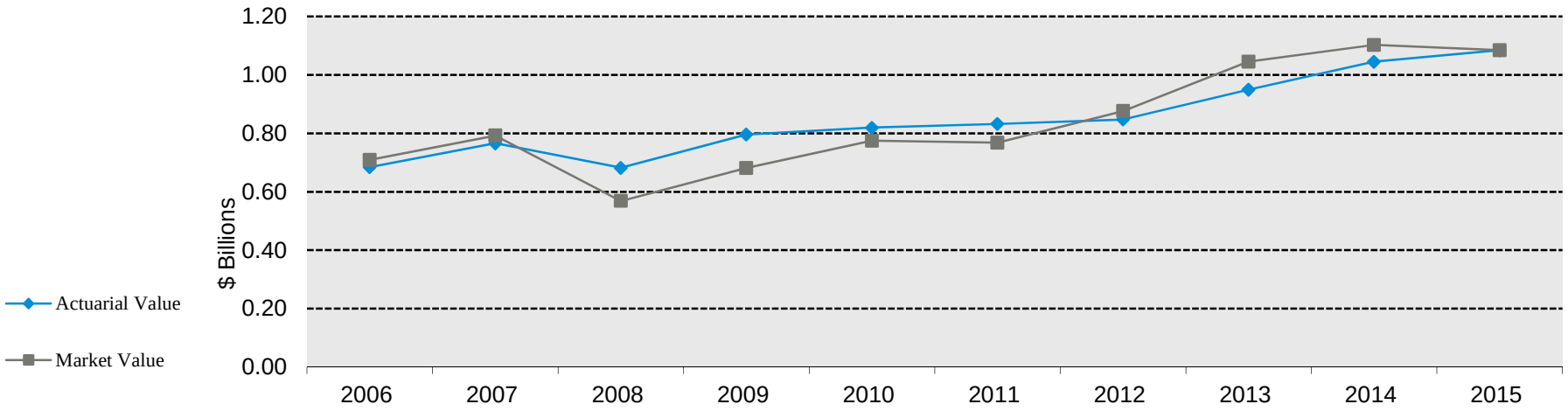
The actuarial value is a representation of the Cambridge Retirement System's financial status. The actuarial asset value is significant because the Cambridge Retirement System's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

With this valuation, the Board made a one-time adjustment to set the actuarial value of assets equal to the market value of assets. This change decreased the actuarial value of assets by $31.8 million, from $1.116 billion to $1.084 billion.

This chart shows how the actuarial value of assets has changed over the past ten years.

CHART 8

Actuarial Value of Assets as of December 31, 2006 – 2015



C. ACTUARIAL EXPERIENCE

To calculate the required contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the contribution requirement will decrease from the previous year. On the other hand, the contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The net experience gain over the two-year period is $61,160,865. A discussion of the major components of the actuarial experience is on the following pages.

This chart provides a summary of the actuarial experience over the past two years.

CHART 9

Actuarial Experience for Two-Year Period Ended December 31, 2015

1.	Net gain from investments before change in asset method*	$32,824,033
2.	Net gain from administrative expenses	227,930
3.	Net gain from other experience**	28,108,902
4.	Net experience gain: (1) + (2) + (3)	$61,160,865

* *Details in Chart 10.*

** *Details in Chart 13.*

Investment Rate of Return

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Cambridge Retirement System's investment policy. For valuation purposes, the assumed rate of return on the actuarial value of assets was 7.875% for 2015 and 2014. The actual rates of return on an actuarial basis for the 2015 and 2014 plan years were 7.91% and 11.05%, respectively, before the change in asset method.

Since the actual return for the year was greater than the assumed return, the Cambridge Retirement System experienced an actuarial gain of $32,824,033 (including an adjustment for interest) during the two-year period ending December 31, 2015 with regard to its investments.

This chart shows the gain/(loss) due to investment experience.

CHART 10

Actuarial Value Investment Experience

	Year Ended December 31, 2015	Year Ended December 31, 2014
1. Actual return	$82,276,599	$104,503,946
2. Average value of assets	1,039,751,334	945,312,569
3. Actual rate of return: (1) ÷ (2)	7.91%	11.05%
4. Assumed rate of return	7.875%	7.875%
5. Expected return: (2) x (4)	$81,880,418	$74,443,365
6. Actuarial gain: (1) – (5)	$396,181	$30,060,581

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis for the last ten years, including five-year and ten-year averages. The investment return on an actuarial basis shown in Chart 11 below reflects the change in asset method to set the actuarial value of assets equal to the market value of assets.

Based upon this experience and future expectations, we have decreased the assumed rate of return from 7.875% to 7.75%.

CHART 11

Investment Return – Actuarial Value of Assets vs. Market Value of Assets: 2006 - 2015

Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent
2006	$50,222,320	7.93%	$79,521,825	12.66%
2007	77,029,038	11.21	78,925,558	11.10
2008	-89,051,384	-11.59	-229,027,048	-28.81
2009	112,693,653	16.51	111,691,775	19.63
2010	26,347,460	3.32	96,012,756	14.12
2011	15,318,166	1.87	-3,728,564	-0.48
2012	19,226,418	2.32	111,822,865	14.59
2013	108,280,094	12.82	175,813,466	20.14
2014	104,503,946	11.05	65,611,478	6.30
2015	50,453,604	4.85	-6,716,067	-0.61
Total	$475,023,315		$479,928,044	
	Five-year average return	6.65%		7.53%
	Ten-year average return	5.91%		6.05%

Notes: Each year's yield is weighted by the average asset value in that year.
Investment return for 2015 includes the change in asset method.

Chart 12 shows the actuairal value of assets rate of return and the market value of assets rate of return over the past ten years.

Administrative Expenses

Administrative expenses for the years ended December 31, 2014 and 2015 were $1,031,915 and $1,076,459, respectively, compared to the assumption of $1,100,000 for calendar 2014 and $1,141,250 for calendar 2015. This resulted in a gain of $227,930 for the two-year period, including an adjustment for interest. Based on budgeted expenses, we have changed the assumption to $1,150,000 for calendar year 2016.

This chart illustrates the rates of return. The actuarial rate of return for 2015 reflects a one-time adjustment to set actuarial value equal to market value.

CHART 12

Actuarial and Market Rates of Return for Years Ended December 31, 2006 - 2015

Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among the participants,
- retirement experience (earlier or later than expected),
- mortality (more or fewer deaths than expected),
- the number of disability retirements, and
- salary increases different than assumed.

The net gain from this other experience for the two-year period ending December 31, 2015 amounted to $28,108,902, which is 2.2% of the actuarial accrued liability.

A brief summary of the demographic gain/(loss) experience of the Cambridge Retirement System for the two-year period ending December 31, 2015 is shown in the chart below.

The chart shows elements of the experience gain/(loss) for the most recent years.

CHART 13

Experience Due to Changes in Demographics for Two-Year Period Ended December 31, 2015

1.	Salary increases less than expected for continuing actives	$17,978,968
2.	Net transfers out of System	5,083,938
3.	Loss due to mortality experience for retired members and beneficiaries	-1,633,512
4.	Data changes and other miscellaneous experience gain	6,679,508
5.	Total	$28,108,902

This valuation reflects the following changes in actuarial assumptions and methods:

- The investment return assumption was lowered from 7.875% to 7.75%.
- The mortality assumption for non-disabled participants was changed from the RP-2000 Combined Healthy Mortality Table projected 17 years using Scale AA to the RP-2000 Employee and Healthy Annuitant Mortality Tables projected generationally from 2009 using Scale BB2D.
- The mortality assumption for disabled participants was changed from the RP-2000 Combined Healthy Mortality Table set forward five years projected 17 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2015 using Scale BB2D.
- The salary increase assumption was changed from 4.75% to 4.50%.
- The administrative expense assumption was changed from $1,100,100 for calendar 2014 to $1,150,000 for calendar 2016.
- The actuarial value of assets was set equal to the market value of assets as of December 31, 2015.

The changes in assumptions and asset method increased the unfunded liability by $76.9 million and increased the employer normal cost by $865,578.

This valuation reflects the following change in the plan provisions:

- As permitted by Section 63 of Chapter 139 of the Acts of 2012, the Board has increased the Section 101 annual allowance from $9,000 to $12,000.

The unfunded liability was expected to decrease from $250.2 million as of January 1, 2014 to $237.2 million as of January 1, 2016. The actual unfunded liability as of January 1, 2016 of $252.9 million is $15.7 million higher than expected as detailed in Chart 14 below.

CHART 14

Development of Unfunded Actuarial Accrued Liability and (Gain)/Loss

	Year Ended December 31, 2015		Year Ended December 31, 2014	
1. Unfunded actuarial accrued liability at beginning of year		$244,677,860		$250,216,274
2. Normal cost at beginning of year, including administrative expenses		32,050,111		30,891,673
3. Total contributions		-59,018,583		-56,348,610
4. Interest				
(a) For whole year on (1) + (2)	$21,792,328		$22,137,250	
(b) For half year on (3)	-2,323,857		-2,218,727	
(c) Total interest		19,468,471		19,918,523
5. Expected unfunded actuarial accrued liability		$237,177,859		$244,677,860
6. Changes due to:				
(a) Experience gain	-$61,160,865		- -	
(b) Assumption changes	45,066,701		- -	
(c) Asset valuation method	31,822,995		- -	
(d) Total changes		15,728,831		- -
7. Unfunded actuarial accrued liability at end of year		$252,906,690		- -

D. RECOMMENDED CONTRIBUTION

The amount of annual contribution required to fund the Plan is comprised of an employer normal cost payment and a payment on the unfunded actuarial accrued liability.

The recommended contribution for fiscal 2017 was set at the City's previously budgeted amount of $39,747,891, plus an additional contribution of $300,000, for a total amount of $40,047,891. In fiscal 2018 and later years, the recommended contribution will be the prior year's budgeted amount increased 5.85% plus an additional contribution of $300,000. This will result in a total fiscal 2018 appropriation of $42,373,143 and a total fiscal 2019 appropriation of $44,834,422. Under this funding schedule, the System will be fully funded by 2026, the same as in the funding schedule adopted with the prior valuation. Chart 16 shows the detail of the funding schedule.

The chart compares this valuation's recommended contribution with the prior valuation.

CHART 15

Recommended Contribution

	Year Beginning January 1			
	2016		2014	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost	$30,778,306	13.93%	$29,791,673	13.63%
2. Administrative expenses	1,150,000	0.52%	1,100,000	0.50%
3. Expected employee contributions	-21,450,503	-9.71%	-20,923,041	-9.57%
4. Employer normal cost: (1) + (2) + (3)	$10,477,803	4.74%	$9,968,632	4.56%
5. Actuarial accrued liability	1,337,405,483		1,199,887,878	
6. Actuarial value of assets	1,084,498,793		949,671,604	
7. Unfunded actuarial accrued liability: (5) - (6)	$252,906,690		$250,216,274	
8. Employer normal cost projected to July 1, 2016 and 2014, adjusted for timing	11,089,317	4.93%	10,546,055	4.74%
9. Projected unfunded actuarial accrued liability	262,523,966		259,881,854	
10. Payment on projected unfunded actuarial accrued liability, including additional $300,000, adjusted for timing	28,958,574	12.88%	25,229,759	11.33%
11. Total recommended contribution: (8) + (10), adjusted for timing	$40,047,891	17.81%	$35,775,814	16.07%
12. Projected payroll	$224,796,824		$222,689,083	

Notes: Recommended contributions are assumed to be paid in the middle of the fiscal year.
Recommended contributions are set equal to the budgeted amount determined with previous valuation.

CHART 16

Funding Schedule

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Remaining Unfunded Liability	(4) Total Plan Cost: (2) + (3)	(5) Additional Payment	(6) Total Unfunded Accrued Liability	(7) Increase Over Prior Appropriation
2017	$11,089,317	$28,658,574	$39,747,891	$300,000	$262,523,966	5.8500%
2018	11,527,942	30,545,201	42,073,143	300,000	252,809,793	5.8500%
2019	11,983,764	32,550,658	44,534,422	300,000	240,384,401	5.8500%
2020	12,457,454	34,682,232	47,139,686	300,000	224,914,323	5.8500%
2021	12,949,706	36,947,652	49,897,358	300,000	206,032,683	5.8500%
2022	13,461,243	39,355,110	52,816,353	300,000	183,336,148	5.8500%
2023	13,992,814	41,913,296	55,906,110	300,000	156,381,626	5.8500%
2024	14,545,199	44,631,418	59,176,617	300,000	124,682,662	5.8500%
2025	15,119,207	47,519,242	62,638,449	300,000	87,705,544	5.8500%
2026	15,715,679	46,271,143	61,986,822	300,000	44,865,060	-1.0403%
2027	16,335,487	- -	16,335,487	- -	- -	-73.6468%

Notes: Recommended contributions are assumed to be paid in the middle of the fiscal year
Assumes contribution of budgeted amount for fiscal year 2017.
Item (2) reflects 3.5% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of mortality improvements due to the generational mortality assumption.
Projected normal cost does not reflect the future impact of pension reform for new hires.

EXHIBIT A

Table of Plan Coverage

Category	Year Ended December 31 2015	2013	Change From Prior Year
Active participants in valuation:			
Number	3,019	3,145	-4.0%
Average age	48.0	47.8	N/A
Average service	14.6	14.3	N/A
Total payroll*	$211,726,778	$208,967,363	1.3%
Average payroll*	70,131	66,444	5.5%
Member contributions	229,178,134	219,143,024	4.6%
Inactive participants entitled to a return of their employee contributions	728	812	-10.3%
Inactive participants with a vested right to a deferred or immediate benefit	126	130	-3.1%
Retired participants:			
Number in pay status	1,387	1,339	3.6%
Average age	72.0	72.0	N/A
Average monthly benefit	$2,936	$2,667	10.1%
Disabled participants:			
Number in pay status	270	266	1.5%
Average age	68.2	68.1	N/A
Average monthly benefit	$3,399	$3,104	9.5%
Beneficiaries in pay status			
Number	362	361	0.3%
Average age	75.2	75.0	N/A
Average monthly benefit	1,636	$1,459	12.1%

** Payroll figures are for the prior calendar year.*

EXHIBIT B

Participants in Active Service as of December 31, 2015
By Age, Years of Service, and Average Payroll

	Years of Service									
Age	**Total**	**0-4**	**5-9**	**10-14**	**15 - 19**	**20 - 24**	**25 - 29**	**30 - 34**	**35 - 39**	**40 & over**
Under 25	35	35	- -	- -	- -	- -	- -	- -	- -	- -
	$37,792	$37,792	- -	- -	- -	- -	- -	- -	- -	- -
25 - 29	209	184	23	2	- -	- -	- -	- -	- -	- -
	$48,403	$46,657	$60,519	$69,735	- -	- -	- -	- -	- -	- -
30 - 34	253	110	104	35	4	- -	- -	- -	- -	- -
	$59,721	$52,287	$63,405	$70,597	$73,193	- -	- -	- -	- -	- -
35 - 39	341	85	103	108	45	- -	- -	- -	- -	- -
	$64,923	$52,068	$69,112	$69,003	$69,823	- -	- -	- -	- -	- -
40 - 44	340	43	82	93	88	33	1	- -	- -	- -
	$71,574	$51,966	$65,449	$71,825	$80,434	$86,820	$110,784	- -	- -	- -
45 - 49	431	45	65	97	100	82	39	3	- -	- -
	$73,830	$53,947	$66,339	$70,059	$75,279	$88,942	$82,634	$80,511	- -	- -
50 - 54	441	29	52	92	97	56	78	32	5	- -
	$72,803	$44,288	$65,560	$68,319	$72,980	$80,442	$85,347	$78,756	$73,222	- -
55 - 59	459	33	47	85	58	79	75	50	32	- -
	$76,369	$45,924	$67,789	$70,038	$69,144	$79,120	$89,867	$94,929	$82,857	- -
60 - 64	353	11	37	66	47	46	52	44	33	17
	$79,545	$61,551	$72,670	$74,314	$77,382	$75,497	$75,431	$85,986	$101,485	$96,717
65 - 69	125	5	12	23	20	17	24	13	5	6
	$78,617	$42,076	$61,744	$79,242	$65,116	$78,158	$96,763	$81,959	$68,219	$115,568
70 & over	32	1	4	3	4	5	4	2	3	6
	$56,803	$28,314	$35,006	$70,780	$38,862	$69,982	$57,376	$62,132	$49,877	$71,377
Total	3,019	581	529	604	463	318	273	144	78	29
	$70,131	$48,989	$66,065	$70,722	$73,920	$81,965	$84,999	$86,675	$87,914	$95,374

EXHIBIT C

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended December 31, 2015		Year Ended December 31, 2014	
Net assets at actuarial value at the beginning of the year		$1,045,457,479		$949,671,604
Contribution income:				
Employer contributions	$37,851,149		$35,775,814	
Employee contributions	21,167,434		20,572,796	
Less administrative expenses	-1,076,459		-1,031,915	
Net contribution income		57,942,124		55,316,695
Net investment income		82,276,599		104,503,946
Total income available for benefits		$140,218,723		$159,820,641
Less benefit payments:				
Pensions and net transfers	-$54,994,965		-$51,091,311	
Net (8)(c) reimbursements	189,575		1,040	
Refunds, annuities and Option B refunds	-14,576,097		-12,962,095	
Workers Compensation Settlements	27,073		17,600	
Net benefit payments		-$69,354,414		-$64,034,766
Change in actuarial asset method		-$31,822,995		$0
Change in reserve for future benefits		$39,041,314		$95,785,875
Net assets at actuarial value at the end of the year		$1,084,498,793		$1,045,457,479

EXHIBIT D

Development of the Fund Through December 31, 2015

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return*	Administrative Expenses	Benefit Payments	Actuarial Value of Assets at End of Year
2006	$25,220,175	$19,077,798	$3,917	$50,222,320	$794,692	$41,076,592	$684,712,253
2007	28,066,908	19,725,429	0	77,029,038	830,697	42,672,369	766,030,562
2008	26,891,503	22,966,497	4,430	-89,051,384	859,128	43,876,275	682,106,205
2009	27,727,711	21,199,168	0	112,693,653	805,680	46,905,287	796,015,770
2010	28,553,542	20,501,312	0	26,347,460	891,447	50,743,313	819,783,324
2011	32,212,987	20,322,105	0	15,318,166	859,734	54,480,133	832,296,715
2012	31,962,897	20,145,293	0	19,226,418	1,001,639	55,073,657	847,556,027
2013	33,815,176	21,640,855	0	108,280,094	986,283	60,634,265	949,671,604
2014	35,775,814	20,572,796	0	104,503,946	1,031,915	64,034,766	1,045,457,479
2015	37,851,149	21,167,434	0	50,453,604	1,076,459	69,354,414	1,084,498,793

** Net of investment expenses. Reflects change in asset method in 2015.*

EXHIBIT E

Department Statistics as of December 31, 2015

Category	Fire	Police	Water	Sewer	Housing	Redevel.	School	Other	Total City	PHC	Total
Active participants in valuation											
Number	268	282	46	210	172	3	498	754	2,233	786	3,019
Average age	45.5	45.0	47.2	50.9	47.6	45.5	47.3	46.4	46.6	51.3	48.0
Average service	18.1	18.5	15.3	14.1	12.4	2.1	11.6	13.5	14.2	15.8	14.6
Total payroll	$25,520,503	$25,129,173	$3,313,885	$12,830,616	$11,504,885	$232,738	$22,390,255	$49,702,538	$150,624,593	$61,102,185	$211,726,778
Average payroll	95,226	89,111	72,041	61,098	66,889	77,579	44,960	65,918	67,454	77,736	70,131
Inactive participants entitled to a return of their employee contributions	0	5	5	9	28	0	252	114	413	413	728
Inactive participants with a vested right to a deferred or immediate benefit	1	2	2	4	5	0	19	26	59	59	126
Retired participants and beneficiaries in pay status											
Retired participants	100	129	24	77	53	10	236	261	890	497	1,387
Disabled participants	94	50	8	26	14	0	31	15	238	32	270
Beneficiaries	57	78	17	55	19	3	42	44	315	47	362
Total number in pay status	251	257	49	158	86	13	309	320	1,443	576	2,019
Total monthly benefits	$1,036,237	$964,111	$118,684	$313,605	$206,008	$28,927	$571,070	$803,971	$4,042,613	$1,539,496	$5,582,109
Average monthly benefit	4,128	3,751	2,422	1,985	2,395	2,225	1,848	2,512	2,802	2,673	2,765

EXHIBIT F

Department Results as of January 1, 2016 – Allocation of 2017 – 2019 Appropriation by Actuarial Cost and Payroll Allocation

	Category	Fire	Police	Water	Sewer	Housing	Redevel.	School	Other	Total City	PHC	Total
1.	Total normal cost	$5,441,466	$5,223,467	$379,408	$1,720,226	$1,494,415	$36,194	$2,953,471	$5,839,523	$23,088,170	$7,690,136	$30,778,306
2.	Administrative expenses	203,315	195,170	14,176	64,274	55,837	1,352	110,353	218,188	862,665	287,335	1,150,000
3.	Expected employee contributions	-2,593,835	-2,556,203	-335,130	-1,272,046	-1,182,153	-24,953	-2,189,625	-4,992,383	-15,146,328	-6,304,175	-21,450,503
4.	Employer normal cost: (1) + (2) + (3)	$3,050,946	$2,862,434	$58,454	$512,454	$368,099	$12,593	$874,199	$1,065,328	$8,804,507	$1,673,296	$10,477,803
5.	Employer normal cost as a percent of payroll	11.44%	10.91%	1.69%	3.83%	3.07%	5.18%	3.75%	2.06%	5.60%	2.62%	4.74%
6.	Actuarial accrued liability	$215,879,776	$207,742,572	$23,678,533	$71,380,225	$51,991,051	$2,885,899	$125,826,378	$233,754,378	$933,138,812	$404,266,671	$1,337,405,483
7.	Actuarial value of assets	175,056,376	168,457,937	19,200,864	57,882,048	42,159,414	2,340,168	102,032,298	189,550,846	756,679,951	327,818,842	1,084,498,793
8.	Unfunded actuarial accrued liability: (6) – (7)	$40,823,400	$39,284,635	$4,477,669	$13,498,177	$9,831,637	$545,731	$23,794,080	$44,203,532	$176,458,861	$76,447,829	$252,906,690
9.	Employer normal cost, projected to July 1, 2016, adjusted for timing	3,226,220	3,026,972	62,030	542,532	389,909	13,327	925,525	1,129,650	9,316,165	1,773,152	11,089,317
10.	Projected unfunded accrued liability	42,375,790	40,778,511	4,647,941	14,011,472	10,205,504	566,483	24,698,897	45,884,459	183,169,057	79,354,909	262,523,966
11.	Payment on remaining unfunded accrued liability	4,625,977	4,451,609	507,395	1,529,570	1,114,090	61,840	2,696,269	5,009,002	19,995,751	8,662,823	28,658,574
12.	Actuarial allocation of fiscal 2017 appropriation: (9) + (11)	7,852,197	7,478,581	569,425	2,072,102	1,503,999	75,167	3,621,794	6,138,652	29,311,916	10,435,975	39,747,891

Category	Fire	Police	Water	Sewer	Housing	Redevel.	School	Other	Total City	PHC	Total
13. Actuarial allocation of fiscal 2018 appropriation	8,278,575	7,886,148	605,621	2,194,607	1,593,439	79,765	3,836,531	6,517,520	30,992,206	11,080,937	42,073,143
14. Actuarial allocation of fiscal 2019 appropriation	8,728,726	8,316,497	644,042	2,324,320	1,688,153	84,639	4,063,930	6,919,225	32,769,532	11,764,890	44,534,422
15. Projected calendar year payroll	26,665,166	26,248,258	3,461,097	13,380,785	12,004,459	243,211	23,322,252	51,800,829	157,126,057	63,837,166	220,963,223
16. Approximate payroll allocation of fiscal 2017	4,796,654	4,721,659	622,598	2,406,998	2,159,418	43,750	4,195,315	9,318,174	28,264,565	11,483,326	39,747,891
17. Approximate payroll allocation of fiscal 2018	5,077,258	4,997,876	659,020	2,547,807	2,285,744	46,309	4,440,741	9,863,287	29,918,042	12,155,101	42,073,143
18. Approximate payroll allocation of fiscal 2019	5,374,278	5,290,251	697,573	2,696,854	2,419,460	49,018	4,700,524	10,440,289	31,668,248	12,866,174	44,534,422

EXHIBIT G

Unit Results as of January 1, 2016

Category	Housing	Redevel.	Other	Total City	PHC	Total
1.Total normal cost	$1,494,415	$36,194	$21,557,561	$23,088,170	$7,690,136	$30,778,306
2.Administrative expenses	55,837	1,352	805,476	862,665	287,335	1,150,000
3.Expected employee contributions	-1,182,153	-24,953	-13,939,222	-15,146,328	-6,304,175	-21,450,503
4.Employer normal cost: (1) + (2) + (3)	$368,099	$12,593	$8,423,815	$8,804,507	$1,673,296	$10,477,803
5.Employer normal cost as a percent of payroll	3.07%	5.18%	5.81%	5.60%	2.62%	4.74%
6.Actuarial accrued liability	$51,991,051	$2,885,899	$878,261,862	$933,138,812	$404,266,671	$1,337,405,483
7.Actuarial value of assets	42,159,414	2,340,168	712,180,369	756,679,951	327,818,842	1,084,498,793
8.Unfunded actuarial accrued liability: (6) – (7)	$9,831,637	$545,731	$166,081,493	$176,458,861	$76,447,829	$252,906,690
9.Actuarial allocation - fiscal 2017 appropriation	1,503,999	75,167	27,732,750	29,311,916	10,435,975	39,747,891
10.Actuarial allocation - fiscal 2018 appropriation	1,593,439	79,765	29,319,002	30,992,206	11,080,937	42,073,143
11.Actuarial allocation - fiscal 2019 appropriation	1,688,153	84,639	30,996,740	32,769,532	11,764,890	44,534,422
12.Projected calendar year payroll	12,004,459	243,211	144,878,387	157,126,057	63,837,166	220,963,223
13.Payroll allocation - fiscal 2017	2,159,418	43,750	26,061,398	28,264,566	11,483,326	39,747,892
14.Payroll allocation - fiscal 2018	2,285,744	46,309	27,585,989	29,918,042	12,155,101	42,073,143
15.Payroll allocation - fiscal 2019	2,419,460	49,018	29,199,769	31,668,247	12,866,174	44,534,421

EXHIBIT H

Definitions of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Assumptions or actuarial assumptions: The estimates on which the cost of the Plan is calculated including:

(a) Investment return — the rate of investment yield that the Plan will earn over the long-term future;

(b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;

(c) Retirement rates — the rate or probability of retirement at a given age;

(d) Withdrawal rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.

Normal cost: The amount of contributions required to fund the benefit allocated to the current year of service.

Actuarial accrued liability for actives: The value of all projected benefit payments for current members less the portion that will be paid by future normal costs.

Actuarial accrued liability for pensioners: The single-sum value of lifetime benefits to existing pensioners. This sum takes account of life expectancies appropriate to the ages of the pensioners and the interest that the sum is expected to earn before it is entirely paid out in benefits.

Unfunded actuarial accrued liability: The extent to which the actuarial accrued liability of the Plan exceeds the assets of the Plan. There are many approaches to paying off the unfunded actuarial accrued liability, from meeting the interest accrual only to amortizing it over a specific period of time.

Amortization of the unfunded actuarial accrued liability: Payments made over a period of years equal in value to the Plan's unfunded actuarial accrued liability.

Investment return: The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

EXHIBIT I

Summary of Actuarial Valuation Results

The valuation was made with respect to the following data supplied to us:			
1.	Retired participants as of the valuation date (including 362 beneficiaries in pay status)		2,019
2.	Participants active during the year ended December 31, 2015 with total accumulated contributions of $229,178,134 and projected 2016 payroll of $220,963,223		3,019
3.	Inactive participants entitled to a return of their employee contributions as of December 31, 2015		728
4.	Inactive participants with a vested right to a deferred or immediate benefit		126
The actuarial factors as of the valuation date are as follows:			
1.	Total normal cost		$30,778,306
2.	Administrative expenses		1,150,000
3.	Expected employee contributions		-21,450,503
4.	Employer normal cost: (1) + (2) + (3)		$10,477,803
5.	Actuarial accrued liability		1,337,405,483
	Retired participants and beneficiaries	$648,130,146	
	Active participants	660,855,043	
	Inactive participants	28,420,294	
6.	Actuarial value of assets ($1,084,498,793 at market value as reported in the Annual Statement)		1,084,498,793
7.	Unfunded actuarial accrued liability: (5) – (6)		252,906,690
The actuarial factors projected to July 1, 2016 are as follows:			
1.	Employer normal cost projected to July 1, 2016, adjusted for timing		$11,089,317
2.	Projected unfunded actuarial accrued liability		262,523,966
3.	Payment on projected unfunded actuarial accrued liability, including additional $300,000 contribution, adjusted for timing		28,958,574
4.	Recommended contribution: (1) + (3)		$40,047,891
5.	Projected payroll		$224,796,824

EXHIBIT II

Funded Ratio

A critical piece of information regarding the Plan's financial status is the funded ratio. This ratio compares the actuarial value of assets to the actuarial accrued liabilities of the Plan as calculated. High ratios indicate a well-funded plan with assets sufficient to cover the plan's actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors.

These measurements are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the System's benefit obligation or the need for or the amount of future contributions.

The chart below depicts a history of the funded ratios for this plan. On a market value basis, the funded ratio has decreased from 87.15% as of January 1, 2014 to 81.09% as of January 1, 2016. On an actuarial value basis (including the change in asset method), the funded ratio has increased from 79.15% as of January 1, 2014 to 81.09% as of January 1, 2016.

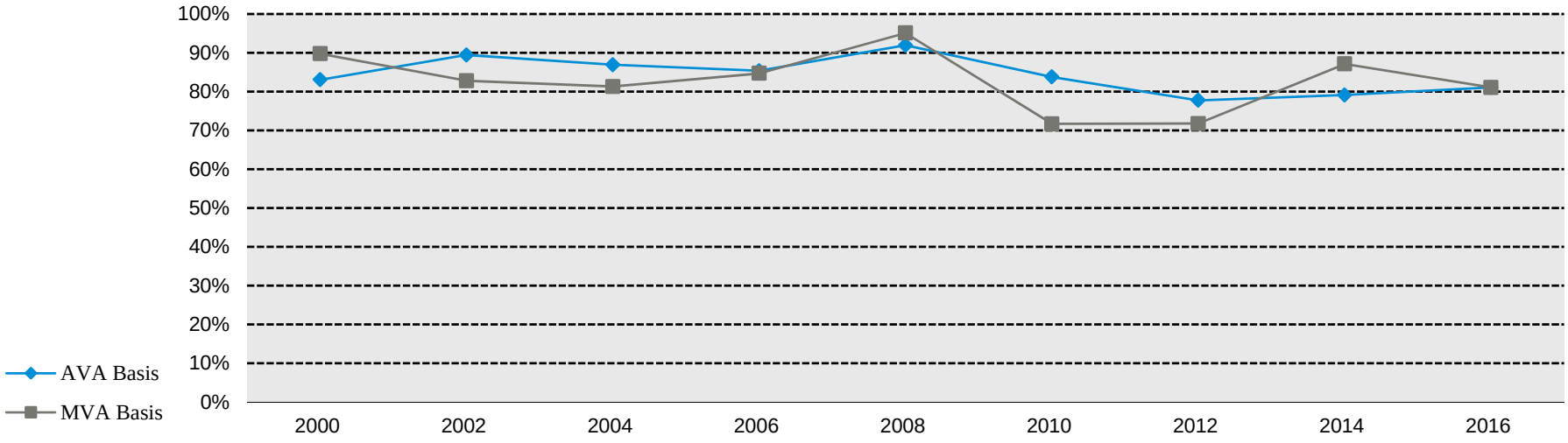


EXHIBIT III

Actuarial Assumptions and Actuarial Cost Method

Mortality Rates:

Pre-retirement:	RP-2000 Employee Mortality Table projected generationally from 2009 using Scale BB2D (Previously, RP-2000 Combined Healthy Mortality Table projected 17 years using Scale AA)
Healthy Retiree:	RP-2000 Healthy Annuitant Mortality Table projected generationally from 2009 using Scale BB2D (Previously, RP-2000 Combined Healthy Mortality Table projected 17 years using Scale AA)
Disabled Retiree:	RP-2000 Healthy Annuitant Mortality Table projected generationally from 2015 using Scale BB2D (Previously, RP-2000 Combined Healthy Mortality Table set forward five years projected 17 years using Scale AA)
	The underlying tables with generational projection to the ages of the participants as of the measurement date reflect the projected mortality experience of the Plan as of the measurement date based on historical and current demographic data. As part of the analysis, a comparison was made between the actual number of retiree deaths and the projected number based on the prior years' assumptions over the three most recent valuations. The mortality tables were then adjusted to future years using a generational projection under Scale BB to reflect future mortality improvement.

Termination Rates before Retirement:

	Groups 1 and 2 – Rate (%)				
	Mortality			Withdrawal	
Age	Male	Female	Disability	PHC	All Other Departments
20	0.03	0.02	0.02	9.94	7.94
25	0.04	0.02	0.04	9.67	7.72
30	0.04	0.03	0.06	9.30	7.22
35	0.08	0.05	0.11	8.71	6.28
40	0.11	0.07	0.20	7.75	5.15
45	0.15	0.11	0.29	6.35	3.98
50	0.21	0.17	0.38	4.22	2.56
55	0.30	0.25	0.48	1.55	0.00
60	0.49	0.39	0.56	0.15	0.00

Notes: *50% of the disability rates shown represent accidental disability.*
20% of the accidental disabilities will die from the same cause as the disability.
50% of the death rates shown represent accidental death.
Mortality rates do not reflect generational projection used in the updated tables nor the 17 year projection used in the prior tables.

Age	Group 4 - Rate (%) Mortality Male	Female	Disability	Withdrawal
20	0.03	0.02	0.20	0.00
25	0.04	0.02	0.40	0.00
30	0.04	0.03	0.60	0.00
35	0.08	0.05	0.60	0.00
40	0.11	0.07	0.60	0.00
45	0.15	0.11	2.00	0.00
50	0.21	0.17	2.50	0.00
55	0.30	0.25	2.40	0.00
60	0.49	0.39	1.70	0.00

Notes: 90% of the disability rates shown represent accidental disability.
60% of the accidental disabilities will die from the same cause as the disability
90% of the death rates shown represent accidental death.
Mortality rates do not reflect generational projection used in the updated tables nor the 17 year projection used in the prior tables.

The termination rates and disability rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of terminations and disability retirements and the projected number based on the prior years' assumptions over the three most recent valuations.

Retirement Rates:

Groups 1 and 2		Group 4	
Age	Rate (%)	Age	Rate (%)
55	5.0	50	5.0
56	2.0	51	2.0
57	2.0	52	2.0
58	2.0	53	2.0
59	2.0	54	2.0
60	5.0	55	25.0
61	2.0	56	2.0
62	25.0	57	2.0
63	5.0	58	2.0
64	5.0	59	2.0
65	10.0	60	25.0
66	10.0	61	10.0
67	100.0	62	10.0
68	100.0	63	10.0
69	100.0	64	10.0
70	100.0	65	100.0

The retirement rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of retirements by age and the projected number based on the prior years' assumptions over the three most recent valuations.

Retirement Age for Inactive Vested Participants:

For participants hired prior to April 2, 2012, 60 for Groups 1 and 2 and 55 for Group 4. For participants hired April 2, 2012 or later, 60 for Group 1, 55 for Group 2, and 50 for Group 4.

The retirement age for inactive vested participants was based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment.

Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics.
Family Composition:	75% of participants are assumed to be married. None are assumed to have dependent children. Females are assumed to be three years younger than their male spouses.
Benefit Election:	All participants are assumed to elect Option A. Benefit elections reflect the fact that all benefit options are actuarially equivalent.
Net Investment Return:	7.75% (previously, 7.875%) The net investment return assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio's asset classes, as well as the Plan's target asset allocation.
Salary Increases:	4.50% (previously, 4.75%) The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment.
Interest on Employee Contributions:	3.5%
Administrative Expenses:	$1,150,000 for calendar 2016, increasing 3.50% per year (previously, $1,100,000 for calendar 2014, increasing 3.75% per year). The administrative expense assumption is based on information on expenses provided by the Retirement System.
Total Service:	Total creditable service reported in the data.
2015 Salary:	2015 salaries are equal to salaries provided in the data except for new hires where salaries were annualized based on date of hire.
Net 3(8)(c) Liability:	No liability is valued for benefits paid to or received from other municipal retirement systems.

Actuarial Value of Assets:	Market value of assets as reported in the System's Annual Statement less unrecognized returns in each of the last five years with a one-time adjustment to set the actuarial value equal to the market value as of December 31, 2015. Unrecognized return is equal to the difference between the actual market return and the expected market return and is recognized over a five-year period, further adjusted, if necessary, to be within 20% of the market value.
Actuarial Cost Method:	Entry Age Normal Actuarial Cost Method. Entry Age is the attained age of the participant minus total creditable service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.
Changes in Assumptions:	Based on past experience and future expectations, the following actuarial assumptions were changed: ➢ The investment return assumption was lowered from 7.875% to 7.75%. ➢ The mortality assumption for non-disabled participants was changed from the RP-2000 Combined Healthy Mortality Table projected 17 years using Scale AA to the RP-2000 Employee and Healthy Annuitant Mortality Tables projected generationally from 2009 using Scale BB2D. ➢ The mortality assumption for disabled participants was changed from the RP-2000 Combined Healthy Mortality Table set forward five years projected 17 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2015 using Scale BB2D. ➢ The salary increase assumption was lowered from 4.75% to 4.50%. ➢ The administrative expense assumption was changed from $1,100,000 for calendar 2014 to $1,150,000 for calendar 2016. ➢ The actuarial value of assets was set equal to the market value of assets as of December 31, 2015.

EXHIBIT IV

Summary of Plan Provisions

This exhibit summarizes the major provisions of Chapter 32 of the Laws of Massachusetts.

Plan Year: January 1 – December 31

Retirement Benefits

Employees covered by the Contributory Retirement Law are classified into one of four groups depending on job classification. Group 1 comprises most positions in state and local government. It is the general category of public employees. Group 4 comprises mainly police and firefighters. Group 2 is for other specified hazardous occupations. (Officers and inspectors of the State Police are classified as Group 3.)

For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

	Age Last Birthday at Date of Retirement		
Percent	**Group 1**	**Group 2**	**Group 4**
2.5	65 or over	60 or over	55 or over
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	--	49
1.8	58	--	48
1.7	57	--	47
1.6	56	--	46
1.5	55	--	45

A member's final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement.

For employees hired on April 2, 2012 or later, the annual amount of the retirement allowance is based on the member's final five-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following tables based on the age and years of creditable service of the member at retirement:

For members with less than 30 years of creditable service:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

For members with 30 years of creditable service or greater:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

A member's final five-year average salary is defined as the greater of the highest consecutive five-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last five years of creditable service prior to retirement.

For employees who became members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit "spiking" of a member's salary to increase the retirement benefit.

For all employees, the maximum annual amount of the retirement allowance is 80 percent of the member's final average salary. Any member who is a veteran also receives an additional yearly retirement allowance of $15 per year of creditable service, not exceeding $300. The veteran allowance is paid in addition to the 80 percent maximum.

Employee Contributions

Date of Hire	Contribution Rate
Prior to January 1, 1975	5%
January 1, 1975 – December 31, 1983	7%
January 1, 1984 – June 30, 1996	8%
July 1, 1996 onward	9%

In addition, employees hired after December 31, 1978 contribute an additional 2 percent of salary in excess of $30,000.

Employees hired after 1983 who voluntarily withdraw their contributions with less than 10 ten years of credited service receive 3% interest on their contributions.

Employees in Group 1 hired on or after April 2, 2012 with 30 years of creditable service or greater will pay a base contribution rate of 6%.

Retirement Benefits (Superannuation)

Members of Group 1, 2 or 4 hired prior to April 2, 2012 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required.

	Members hired prior to April 2, 2012 who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System). Members of Group 1 hired April 2, 2012 or later may retire upon the attainment of age 60. Members of Group 2 or 4 hired April 2, 2012 or later may retire upon the attainment of age 55. Members of Group 4 may retire upon attainment of age 50 with ten years of creditable service. Members hired April 2, 2012 or later who terminate before age 55 (60 for members of Group 1) with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (60 for members of Group 1) provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System.
Ordinary Disability Benefits	
	A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent years' pay plus an annuity based on his or her own contributions.
Accidental Disability Benefit	
	For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his or her own contributions, plus additional amounts for surviving children. Benefits are capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.

Death Benefits

In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of $500 per month, and there are additional amounts for surviving children.

If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay, in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held be the member at the time of death.

Upon the death of a job-connected disability retiree who retired prior to November 7, 1996 and could not elect an Option C benefit, a surviving spouse will receive an allowance of $12,000 per year (previously, $9,000) if the member dies for a reason unrelated to cause of disability.

"Heart And Lung Law" And Cancer Presumption

Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.

Options	Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.
Post-Retirement Benefits	The Board has adopted the provisions of Section 51 of Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first $14,000 of a retirement allowance. Cost-of-living increases granted prior to July 1, 1998 are reimbursed by the Commonwealth and not reflected in this report.
Changes in Plan Provisions	As permitted by Section 63 of Chapter 139 of the Acts of 2012, the Board has increased the Section 101 annual allowance from $9,000 to $12,000.